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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/471,173	12/23/1999	NARIHIRO MOROSAWA	0020-4652P	7107

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EXAMINER

QUINTO, KEVIN V

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 10/02/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/471,173

Applicant(s)

MOROSAWA ET AL.

Examiner

Kevin Quinto

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 09 August 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 2 and 13-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 13, 16, 19 and 22 is/are allowed.
- 6) ☒ Claim(s) 2, 14, 15, 17, 18, 20, 21, 23 and 24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Arguments***

1. It is the examiner's belief that the additional limitation "and flat band voltage is stable even if fluorine injection occurs" does not overcome the rejection of 35 USC § 103. See the below section titled *Claim Rejections - 35 USC § 103* for further details.

### ***Specification***

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 24 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. The examiner is not certain of the metes and bounds of the word "interact" in claim 24. In p.14 of the specification, the applicant states that the "addition of fluorine to the nitrated oxide having a nitrogen concentration of  $1 \times 10^{20} / \text{cm}^3$  reduced the deterioration of transconductance." The examiner is not certain as to whether or not the applicant is implying that a chemical reaction or bonding is taking place between the fluorine and the nitrogen. The examiner believes

Art Unit: 2826

that the presence of fluorine is what reduces “the deterioration of transconductance” and not any chemical bonding between the fluorine and the nitrogen.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 2, 14, 15, 17, 23, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mitani et al. (USPN 6,191,463 B1) in view of Wristers et al. (USPN 5,674,788).

8. In reference to claim 2, Mitani et al. (USPN 6,191,463 B1, hereinafter referred to as the “Mitani” reference) discloses a similar device. In claim 9 of Mitani (column 44, lines 9-19), a substrate is described with a gate electrode over a gate insulator. The gate insulator is composed of a combination of silicon, oxygen, nitrogen, and fluorine (a halogen element).

9. Mitani does not disclose the exact nitrogen atom concentration of the applicant (more than  $1 \times 10^{20} \text{ cm}^{-3}$ ). However it is known in the semiconductor art that having a nitrogen atom concentration of this quantity in a gate insulator has the benefit of preventing the penetration of boron atoms into the gate insulator. This is disclosed by Wristers et al. (USPN 5,674,788, hereinafter referred to as the “Wristers” reference) in column 8, lines 2-6. Therefore it would be obvious to utilize a gate insulator having a nitrogen concentration greater than  $1 \times 10^{20}$  atoms/cm<sup>2</sup> in the device of Mitani so as to attain the advantage of preventing boron penetration into the gate insulator.

Art Unit: 2826

10. It is the examiner's belief that the additional limitation "and flat band voltage is stable even if fluorine injection occurs" does not overcome the rejection of 35 USC § 103. The examiner believes that when "fluorine injection" is referred to in the claim, it is referring to the addition of fluorine in the gate insulator. The examiner believes that this is the intent of the applicant's invention; the presence of fluorine in the gate insulator prevents the boron from going into the substrate. The device of Mitani already contains a fluorine concentration.

11. Regarding claim 14, the device of Mitani constructed in view of Wristers meets the claim. In claim 9 of Mitani, the fluorine concentration of the gate insulator is  $1 \times 10^{20}$  atoms/cm<sup>3</sup> to  $1 \times 10^{21}$  atoms/cm<sup>3</sup>. This meets the limitation where the fluorine concentration is more than  $1 \times 10^{19}$  atoms/cm<sup>3</sup>.

12. Regarding claims 15, 17, 21 and 23; both Mitani and Wristers utilize boron doped polysilicon gates. In the device of Mitani constructed in view of Wristers, boron diffusion into the substrate is prevented by a gate insulator having a nitrogen concentration greater than  $1 \times 10^{20}$  atoms/cm<sup>2</sup>.

13. So far as understood in claim 24, the device of Mitani constructed in view of Wristers meets this claim. As discussed above, the examiner is unsure of the metes and bounds of the word "interact." In p.14 of the specification, the applicant states that the "addition of fluorine to the nitrided oxide having a nitrogen concentration of  $1 \times 10^{20}$  /cm<sup>3</sup> reduced the deterioration of transconductance." The examiner is not certain as to whether or not the applicant is implying that a chemical reaction or bonding is taking place between the fluorine and the nitrogen. The examiner believes that the presence of fluorine is what reduces "the deterioration of transconductance" and not any chemical bonding between the fluorine and the nitrogen. The

Art Unit: 2826

examiner believes that this additional limitation is not patentable over the combination of Mitani and Wristers because this limitation repeats a structural limitation already made in claim 2; that fluorine and nitrogen are present in the gate insulator.

14. Claims 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mitani et al. (USPN 6,191,463 B1) in view of Wristers et al. (USPN 5,674,788) as applied to claims 2 and 14 above, and further in view of Gardner et al. (5,851,888).

15. Regarding claims 18 and 20, neither Mitani nor Wristers discloses the exact thickness. However the use of thin gate dielectrics is well known in the art. Gardner et al. (USPN 5,851,888, hereinafter referred to as the "Gardner" reference) discloses a 3 nm nitrided gate insulator (claim 1). Such thin gate dielectrics are used for the advantage of reducing short channel effects (column 1, lines 30-32). It would therefore be obvious to construct the nitrided gate insulator of the device of Mitani constructed in view of Wristers with a thickness of 3 nm; which is between 0.5-5 nm.

#### ***Allowable Subject Matter***

16. Claims 13, 16, 19, and 22 were allowed in the previous Office action.

#### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Quinto whose telephone number is (703) 306-5688. The examiner can normally be reached on M-F 8AM-5PM.

Art Unit: 2826

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (703) 308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

KVQ  
September 30, 2002

**NATHAN J. FLYNN**  
**SUPERVISORY PATENT EXAMINER**  
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